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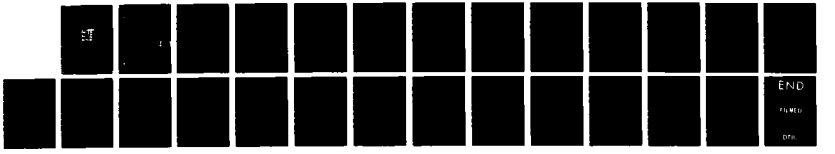

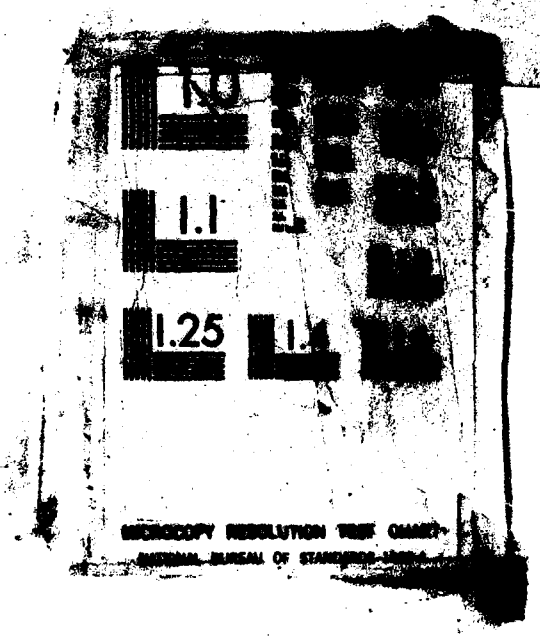
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The Final Report presents abstracts for publications and Technical Reports prepared for the contract, and overviews initial results of the development of a Team Readiness Questionnaire.

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Overview

The major thrust of the research conducted under this contract was to refine and test a model of leadership wherein leaders' behaviors toward subordinates are cross-situationally specific. In agreement with dyadic models of leadership, it was predicted that, within a given situational context (e.g., conditions of high stress), a leader would use different leader behaviors for different subordinates (e.g., provide more influence opportunities to high performing subordinates than to low performing subordinates). However, unlike many current leadership theories, it was not assumed that the leader would maintain a consistent or characteristic leadership style for dealing with subordinates as the situational context changed (e.g., a temporary shift from low to high stress conditions). Rather, it was predicted that leaders would be capable of adjusting their behaviors to differences in situations (i.e., cross-situational specificity) as well as to differences in subordinates. Indeed the theory of cross-situational specificity holds that effective leaders learn to identify crucial differences among situations and among subordinates and to adjust their leader behaviors accordingly. This model was supported by empirical research on Naval personnel (cf. James & White, 1983).

An important aspect of the research involved consideration of measurement and methodological issues. For example, it was necessary to develop a statistical test of homogeneity of regression equations, given repeated measures data, in order to test the research hypothesis of cross-situational specificity of leader behaviors.

Finally, transition research was initiated to devise a preliminary plan for conducting research on factors that determine Navy team effectiveness during simulation exercises. The transition research was conducted at the Fleet Anti-Submarine Warfare (ASW) Training Center, San Diego. Initial efforts involved the development of an intrument for the assessment of "team readiness".

The research results are reviewed below in the form of abstracts of the technical reports and other publications which were completed during the contract. The results of the initial analysis on team readiness are described briefly at the conclusion of the abstracts.

I. Technical Reports

Title: Estimating Interrater Reliability in Incomplete Designs

Authors: Lawrence R. James, Geritt Wolf and Robert G. Demaree

Report Date: August 31, 1981, 32 pages

Report Number: IBR 81-14

Organization: Institute of Behavioral Research,
Texas Christian University, Fort Worth, Texas 76129

Estimates of interrater reliability are often needed for incomplete designs in which raters (e.g., employees) are nested within targets (e.g., organizations). It is shown that the popular use of estimates based on between-group ANOVAs accompanied by intraclass correlations can be seriously misleading if low variation exists among target means. An alternative based on a within-group procedure is proposed and shown to be superior to the intraclass correlation in the condition of low variation among group means, accompanied by low within-group variation.

Title: Organizational Climate: Another Look at a Potentially Important Construct

Author: Lawrence R. James

Report Date: April 7, 1982, 33 pages

Report Number: IBR 82-4

Organization: Institute of Behavioral Research,
Texas Christian University, Fort Worth, Texas 76129

Organizational climate is examined from the standpoint of the need to demonstrate interrater reliability (agreement) among individuals' perceptions of psychological climate. It is shown that if prior estimates of interrater reliability are accurate, then organizational climate is a moot issue. It is then demonstrated that at least some prior estimating procedures likely provided underestimates of interrater/perceptual agreement. A new procedure for estimating reliability is suggested and illustrated. The new procedure provided substantially higher estimates of interrater reliability than prior methods. It is concluded that organizational climate is potentially salvageable, although more attention needs to be given to the appropriate level of explanation for climate variables.

II. Technical Reports/ Journal Articles/ Books

Title: Aggregation Bias in Estimates of Perceptual Agreement

Author: Lawrence R. James

Report Date: August 1, 1981, 20 pages

Report Number: IBR 81-12

Organization: Institute of Behavioral Research
Texas Christian University, Fort Worth, Texas 76129

Published: In Journal of Applied Psychology (1982), 67, 219-229.

The need to demonstrate agreement among individuals' perceptions of climate prior to averaging climate scores is discussed from the perspective of aggregation. It is then shown that estimates of agreement based on group mean scores have been incorrectly interpreted as applying to perceptual agreement among individuals. Of initial importance is a study by Drexler, who concluded that a considerable proportion of the variance in climate perceptions is accounted for by organizational membership. This conclusion has been employed recently by other authors to support the assumption that individuals in the same environment tend to agree with respect to climate perceptions. The present article demonstrates that Drexler's analysis provided inflated estimates of agreement among individuals. The logic of the approach is then extended to other studies in which inflated estimates of agreement appeared likely.

Title: Causal Analysis

Authors: Lawrence R. James, Stanley A. Muliak and Jeanne M. Brett

Report Number: GT-ONR-1

Organization: School of Psychology
Georgia Institute of Technology, Atlanta, GA 30332

Published As: Causal Analysis: Assumptions, models, and data (1982). Beverly Hills, CA: Sage.

There is a serious need in psychological research to specify the conditions that justify the application of confirmatory (causal) analysis and the use of the results of confirmatory analysis to support causal inference with nonexperimental data - that is, data based on naturally occurring events. The term "confirmatory analysis" is used here to refer to a family of procedures, which includes confirmatory factor analysis, linear structural relations, path analysis, structural equations, and time series. The term "confirmatory" denotes that these procedures are designed to evaluate the utility of causal hypotheses by testing the fit between a theoretical model and empirical data. If a theoretical model is shown to have a "good fit" with the data, then the model is regarded as confirmed. Conversely, a theoretical model is disconfirmed if it has a "poor fit" with the data.

Chapter 1 begins with an overview of the philosophical issues surrounding the idea of causation. The rationale for testing the utility of causal hypotheses by confirmatory analysis is developed in greater detail in Chapter 2 by overviewing ten conditions that, if reasonably satisfied, justify confirmatory analysis. The role of confirmatory analysis in causal inference is addressed in Chapter 3, where the advantages and disadvantages of confirmatory analysis in the context of the equivocality of causal inference is discussed. Finally, Chapter 4 is devoted to an overview of latent variable models, which are models designed to evaluate the utility of causal hypotheses among theoretical constructs.

Title: Cross-Situational Specificity in Managers' Perceptions of Subordinate Performance, Attributions, and Leader Behaviors

Authors: Lawrence R. James and John F. White, III

Report Date: May 20, 1982, 66 pages

Report Number: GT-ONR-2, IBR 82-7

Organization: School of Psychology
Georgia Institute of Technology, Atlanta, GA 30332

Published: In Personnel Psychology (1983), 36, 809-856.

Managers' perceptions of subordinates' performance, causes (attributions) of subordinates' performance, and the leader behaviors they employed toward subordinates were examined from the standpoint of cross-situational consistency versus cross-situational specificity. Cross-situational consistency would be indicated if manager's perceptions of performance, attributions, and leader behaviors were stable over different situations, whereas cross-situational specificity would be indicated if these same perceptions indicated reliable variation, as a function of situation. Empirical results for 377 Navy managers provided strong support for cross-situational specificity. Results are discussed in relation to prior research, generated by interactional theory on consistency versus specificity of responses across situations, and in relation to research and developmental needs in leadership, attribution theory, and performance evaluation.

Title: A Multivariate Test for Homogeneity of Regression Weights for Correlated Data

Author: Lawrence R. James and Lois E. Tetrick

Report Date: September, 5, 1982, 21 pages

Report Number: GT-ONR-3

Organization: School of Psychology
Georgia Institute of Technology, Atlanta, GA 30332

Published: In Educational and Psychological Measurement (1984), 44, 769-780.

An analytic procedure is presented for testing the homogeneity of unstandardized regression weight vectors in the condition that the regression weight vectors are correlated. The basic design involves repeated measurements on a dependent variable and a set of independent variables in each of S time periods or situations. Use of the test is illustrated in a study of cross-situational consistency versus cross-situational specificity of the correlates of perceived leader behavior.

Title: Estimating Within-Group Interrater Reliability With and Without Response Bias

Authors: Lawrence R. James, Robert G. Demaree, and Gerrit Wolf

Report Date: December 9, 1983, 36 pages

Report Number: GT-ONR-4

Organization: School of Psychology

Georgia Institute of Technology, Atlanta, GA 30332

Published: In Journal of Applied Psychology (1984), 69, 85-98.

This article presents methods for assessing agreement among the judgments made by a single group of judges on a single variable in regard to a single target. For example, the group of judges could be editorial consultants, members of an assessment center, or members of a team. The single target could be a manuscript, a lower level mangager, or a team. The variable on which the target is judged could be overall publishability in the case of the manuscript, managerial potential for the lower level manager, or team cooperativeness for the team. The methods presented are based on new procedures for estimating interrater reliability. For situations such as the above, these procedures are shown to furnish more accurate and interpretable estimates of agreement than estimates provided by procedures commonly used to estimate agreement, consistency, or interrater reliabilty. In addition, the proposed methods include processes for controlling for the spurious influences of response biases (e.g., positive leniency, social desirability) on estimates of interrater reliability.

Title: Mediators, Moderators, and Tests for Mediation

Authors: Lawrence R. James and Jeanne M. Brett

Report Date: December 9, 1983, 48 pages

Report Number: GT-ONR-5

Organization: School of Psychology
Georgia Institute of Technology, Atlanta, GA 30332

Published: In Journal of Applied Psychology (1984), 69, 307-321.

The following points are developed. First, mediation relations are generally thought of in causal terms. Influences of an antecedent are transmittted to a consequence through an intervening mediator. Second, mediation relations may assume a number of functional forms, including nonadditive, nonlinear, and nonrecursive forms. Special attention is given to nonadditive forms, or moderated mediation, where it is shown that, although mediation and moderation are distinguishable processes, a particular variable may be both a mediator and a moderator within a single set of functional relations. Third, current procedures for testing mediation relations in industrial and organizational psychology need to be updated because these procedures often involve a dubious interplay between exploratory (correlational) statistical tests and causal inference. It is suggested that no middle ground exists between exploratory and confirmatory (causal) analysis and that attempts to explain how mediation processes occur require well-specified causal models. Given such models, confirmatory analytic techniques furnish the more informative tests of mediation.

III. Journal Articles/ Book Chapter

Title: The Unmeasured Variables Problem in Path Analysis

Author: Lawrence R. James

Published: In Journal of Applied Psychology (1980), 65, 415-421.

The unmeasured variables problem has not received adequate attention in applications of path analysis. The ramifications of inadequate attention to this problem are addressed in respect to correlations between causal variables and the errors of causal equations and the resulting bias in solutions of path coefficients. This discussion recognizes that obviation of the unmeasured variables problem is an unrealistic objective. Consequently, logic is provided in the form of decison steps to help investigators ascertain whether the influence of unmeasured variables that can be expected in any particular analysis is of sufficient seriousness to preclude the use of path analysis.

Title: A Statistical Rationale for Relating Situational Variables and Individual Differences

Authors: Lawrence R. James, Robert G. Demaree, and John J. Hater

Published: In Organizational Behavior and Human Performance (1980) 25, 354-364.

A statistical rationale is presented for relating situational variables (e.g., technological complexity) to person variables (e.g., environmental perceptions, attitudes). A procedure is described wherein correlations are determined between a person variable and one or more situational variables after the scores on the situational variables have been assigned to individuals. The results of the procedure provide opportunities to ascertain (a) the degree to which variation among individuals on a person variable is associated with situational differences, and (b) the degree to which a situational variable accounts for the total possible variation in the person variable that is associated with between-group differences.

Title: A Test for Asymmetric Relationships Between Two Reciprocally Related Variables

Author: Lawrence R. James

Published: In Multivariate Behavioral Research (1981), 16, 63-82.

Recent research has indicated the need for a test to compare the magnitudes of relationships among reciprocally related variables. A test is developed to ascertain whether the difference between the relationship of two reciprocally related variables is significant; the estimates of reciprocal relationships were based on the two-stage least squares (2SLS) analytic

procedure. Assumptions and conditions required to conduct the test are discussed, and, since the test employed standardized variables, the use of standardized variables in 2SLS is reviewed.

Title: Perceptions of Psychological Influence: A Cognitive Information Processing Approach for Explaining Moderated Relationships

Authors: Lawrence R. James, John J. Hater, and Alvin Jones

Published: In Personnel Psychology (1981), 34, 453-477.

A hypothesis of consistency in cognitive information processing of perceptions of psychological influence (perceived influence of decisions made by a supervisor) was proposed and tested. The hypothesis stated that if (a) having influence was of sufficient importance to a subordinate to effect selective attention to supervisor behaviors that reflected opportunities for influence, then (b) the subordinate would employ perceptions of influence in behavioral decisions (performance) and affective reactions (anxiety, satisfaction). The hypothesis received support in a study of 363 Navy enlisted aircraft maintenance personnel, where selective attentiveness to opportunities for influence was determined by assessing the fit between personal characteristics of a subordinate (e.g., achievement motivation) and the degree of overload in the work environment. Results suggested that relations between perceptions of influence and attitudes/performance should be expected only for those individuals who are attentive to opportunities for influence in the early stages of cognitive processing. Implications of these results for future scientific and professional endeavors are discussed.

Title: Psychological Climate: Theoretical Perspective and Empirical Research

Authors: Lawrence R. James and S. B. Sells

Published: In D. Magnusson (Ed.) (1981), Toward a Psychology of Situations: An Interactional Perspective. Hillsdale, NJ: Erlbaum.

Psychological climate refers to individuals' cognitive representations of proximal environments, expressed in terms that represent the personal or acquired meaning of environments to individuals. This article deals with the assumptions underlying psychological climate, illustrations of empirical research, including measurement issues, and implications of the psychological-climate approach for research on environmental perceptions.

Title: A Multivariate Test for Sequential Moderation

Authors: Lawrence R. James, George W. Joe, and Dennis M. Irons

Published: In Educational and Psychological Measurement (1982), 42, 951-960.

An analytic procedure is presented which casts sequential moderator analysis in the role of a multivariate test of parallelism of regressions. The procedure addresses a test for comparing predictor-criterion relationships for one set of measurements on multiple predictors and repeated measurements on a criterion. The application of the sequential moderation

test to issues associated with dynamic criteria is discussed.

Assessment of Team Readiness

The final study conducted under this contract involved the development of a procedure to assess team readiness -- that is, to assess factors pertaining to team composition and functions believed to be important causes of team effectiveness in ASW simulated combat exercises. Development of a measurement of team readiness was predicated on extensive observation of ASW teams in simulated combat exercises and many interviews with ASW instructors and ASW team members. A Team Readiness Questionnaire was developed jointly by the research team and instructors from the ASW Training Center, San Diego. Presented below is an overview of the initial construct validation work on the Team Readiness Questionnaire and an analysis of interrater reliability for ASW team members, using both traditional techniques and the new procedure recommended by James, Demaree, and Wolf (1984).

Methods

Subjects:

The subjects of the study were 221 members of ASW teams engaged in training and evaluation exercises at the ASW Training Center, San Diego, California.

Instruments:

All subjects completed a 25-item Team Readiness Questionnaire designed to assess the following a priori categories: 1) knowledge and skills of team members in regard to ASW, 2) communication within ASW subteams (e.g. sonar, combat information center), 3) cooperation and identification as a team, 4) manning level and experience as a team, 5) motivation of team members, 6) clarity of role as a team member, 7) importance of team performance, 8) stress, 9) cooperation among ASW subteams, 10) communication from other ASW subteams, and 11) communications to other ASW subteams. Items in the questionnaire were scaled on a five-point, Likert-type response format (1 = strongly disagree,...., 5 = strongly agree). Confidentiality of responses was assured.

Analyses:

After random elimination of all but one questionnaire for each ASW team member (a number of team members participated in more than one ASW exercise), the item data for 221 individuals were subjected to a component analysis. Using scales empirically derived from the component analysis, interrater reliabilities were computed and used as estimators of the degree to which members of ASW teams agreed in regard to perceptions of team readiness. Two different estimation procedures were employed, namely 1) the intraclass correlation (ICC) approach, which is based on a between-teams ANOVA, and 2) the within-group interrater reliability statistic described in the reports

listed earlier (cf., James, Demaree & Wolf, 1984). No team with fewer than four respondents was retained for these analyses. The analytic sample consisted of 33 teams, ranging in size from four to 16 team members.

Results

A principle component analysis with oblique rotation yielded six components on which non-overlapping patterns of items loaded at $\geq |\pm .40|$. These "dimensions" of team readiness were 1) role clarity (e.g., "I was kept informed of the things I needed to know to do my job"), 2) interdependence among ASW subteams (e.g., "My sub-team gave accurate information to other sub-teams"), 3) communication gatekeeping (e.g., "Other sub-teams were too slow in giving my sub-team information"), 4) stress (e.g., "Members of my sub-team felt under pressure during this exercise"), 5) identification with team ("The success of my sub-team was more important than the success of any individual member"), and 6) manning ("There were not enough people on my sub-team to do our job well").

Composite scales were constructed for the first four of these dimensions (role clarity, interdependence, gatekeeping, and stress), using the items which loaded highly on the four respective components. Coefficient alphas for these composites ranged from .66 to .79. The remaining two components, group identification and manning, were defined primarily by a single item.

The results of the between-teams interrater reliability analyses (ANOVA

and ICC) for the 33 teams are presented in Table 1. The significant F-ratios for five of the six dimensions indicated that the ASW teams differed in their perceptions of team readiness on all but one of the dimensions. However, for four of these analyses (role clarity, gatekeeping, group identification, and manning), the homogeneity of within-team variance assumption of ANOVA was violated, as indicated by a significant Bartlett-F statistic in Table 1. Technically, the ANOVA's and ICC estimates for these four dimensions are uninterpretable. Furthermore, the intraclass correlation (ICC) approach for estimating within-team agreement (interrater reliability) on the dimensions of team readiness appeared to underestimate the degree of within-team agreement demonstrated by the use of the James et al. statistic ($r_{\underline{WG}(\underline{J})}$, or $r_{\underline{WG}}$ for the one-item dimensions), which are reported in Table 2.

The logic underlying the James et al. (1984) statistic is as follows: if all the within-team responses to a single item were a function of random measurement error, rather than reflecting a shared perception among team members, each response on the response scale would be equally likely to occur. Therefore, in a case of no agreement (reliability), the expected variance distribution of the responses would be a uniform (rectangular) distribution. Assuming, then, that the observed variance (s_x^2) is also a function of lack of agreement due to random measurement error, the ratio of observed to expected variance gives the proportion of error variance

Table 1

Between-Teams Analyses of ASW Subordinate Agreement

Dimension	Bartlett F	F-Ratio	ICC
Role Clarity	1.957**	4.459**	.35
Interdependence	1.062	2.791**	.22
Gatekeeping	1.551*	2.881**	.23
Stress	1.206	5.057**	.39
Group Identification	1.693*	.863	.00
Manning	1.918*	1.789*	.11

** $p < .001$

* $p < .05$

Table 2

Within-Group Analysis of ASW Subordinate Agreement

PC Dimension	Values of $r_{WG(J)}$ or r_{WG}		
	Range	Interval	Frequency
Role Clarity	.71 - .98	.00 -.70	0
		.71 -.80	1
		.81 -.90	9
		.91 - 1.00	23
Interdependence	.67 - .97	.00 - .70	1
		.71 - .80	0
		.81 - .90	3
		.91 - 1.00	29
Gatekeeping	.34 - .97	.00 - .70	2
		.71 - .80	0
		.81 - .90	10
		.91 - 1.00	21
Stress	.62 - .96	.00 - .70	4
		.71 - .80	6
		.81 - .90	18
		.91 - 1.00	5
Group Identification	.00 - .93	.00 - .70	24
		.71 - .80	2
		.81 - .90	5
		.91 - 1.00	2
Manning	.00 - .93	.00 - .70	19
		.71 - .80	2
		.81 - .90	10
		.91 - 1.00	2

in the sample. The reliability coefficient estimating agreement thus becomes

$$r_{WG} = 1 - \frac{s_x^2}{\sigma_{EU}^2}$$

where s_x^2 is the observed variance and σ_{EU}^2 is the variance of the uniform distribution expected in the case of no agreement or a reliability of zero. If there is no variance in observed scores, $s_x^2 = 0$ and $r_{WG} = 1.00$; as s_x^2 approaches σ_{EU}^2, however, r_{WG} decreases. (If the observed variance exceeds the expected, the value of r_{WG} will be negative or assume a value greater than 1.00; under such circumstances the r_{WG} should be set to zero .)

Applying the Spearman-Brown prophecy, the single item r_{WG} can be extended to estimate the reliability of within-team responses on J essentially parallel items. The equation for the multiple-item statistic is

$$r_{WG(J)} = \frac{J[\,1 - (\bar{s}_{x_j}^2 / \sigma_{EU}^2)]}{J[\,1 - (\bar{s}_{x_j}^2 / \sigma_{EU}^2)] + (\bar{s}_{x_j}^2 / \sigma_{EU}^2)}$$

where J = the number of essentially parallel items,

$\bar{s}_{x_j}^2$ = the mean item variance of the J items, and

σ_{EU}^2 = the variance expected under the uniform distribution

In the present study, the $r_{WG(J)}$'s on each of the four composite scales and the r_{WG}'s on the two single-item dimensions were calculated for each team. Table 2 indicates a high degree of agreement on team members'

perceptions for the four composites even though within-team agreement falls off substantially in the one-item dimensions of group identification and manning.

Conclusions

The assessment of perceptual agreement among team members is an essential first step in determining whether or not a given team shares a particular level of readiness on such dimensions as role clarity and interdependence among ASW subteams. The results imply that a within-group analysis of team members' perceptions provides more insight into this agreement than do traditional techniques using ANOVA and intraclass correlations. With the information gleaned from the within-team analysis, one can investigate what variables contribute to agreement or non-agreement, the manner in which a shared perception of team readiness serves as a moderator of team effectiveness, and the implications of this moderator effect for establishing optimally efficient training procedures.

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